R E P O R T R E S U M E S

ED 013 283 UD 004 062

HEALTH AND THE EDUCATION OF SOCIALLY DISADVANTAGED CHILDREN.

BY- BIRCH, HERBERT G.
YESHIVA UNIV., NEW YORK, N.Y., FERKAUF GRAD. SCH.

PUB DATE 67

CONTRACT OEC-6-10-240
EDRS PRICE MF-$0.25 HC-$2.20 55P.

DESCRIPTORS- *HEALTH, *DISADVANTAGED YOUTH, *EDUCATIONAL RETARDATION, NUTRITION, *RESEARCH, HEALTH CONDITIONS, FAMILY HEALTH, NEGROES, LEARNING DIFFICULTIES, BIBLIOGRAPHIES, MOTHERS, CHILD DEVELOPMENT,

THE POOR HEALTH OF THE DISADVANTAGED CHILD IS A PRIMARY VARIABLE IN HIS EDUCATIONAL FAILURE. AN EXTENSIVE REVIEW OF HEALTH STUDIES SHOWS THAT NEGROES, PUERTO RICANS, AND INDIANS SUFFER FROM THE GREATEST HEALTH PROBLEMS. THE HEALTH FACTORS WHICH THESE STUDIES FOUND TO RELATE SPECIFICALLY TO INTELLECTUAL AND EDUCATIONAL DEFICITS ARE PREMATURITY, OBSTETRICAL AND PERINATAL COMPLICATIONS, BIRTH WEIGHT, MATERNAL PHYSICAL CHARACTERISTICS AND NUTRITION, AND PRENATAL CARE. THEY ALSO SHOW THAT, A SYSTEMATIC RELATIONSHIP EXISTS AFTER BIRTH BETWEEN A CHILD'S NUTRITIONAL INADEQUACY AND BOTH NEUROLOGICAL MATURATION AND LEARNING COMPETENCY. ALTHOUGH SEVERE MALNUTRITION IN THE UNITED STATES IS RARE, SUBCLINICAL MALNUTRITION AMONG LOW-INCOME GROUPS (PARTICULARLY IRON DEFICIENCY) MAY BE A FACTOR IN THEIR HIGHER CHILDHOOD MORBIDITY AND MORTALITY RATES, AS WELL AS IN THE CONSTITUTIONAL DIFFERENCES BETWEEN NEGROES AND WHITES. MALNUTRITION AND MALDEVELOPMENT ADVERSELY AFFECT THE DISADVANTAGED CHILD'S NERVOUS SYSTEM AND, THEREFORE, HIS LEARNING POTENTIAL. SUCH IMPAIRMENT IS A PRIMARY HANDICAP WHICH CAN BE ONLY PARTLY REMEDIATED BECAUSE THE EFFECTS OF A BIOSOCIAL PATHOLOGY CAUSE DISADVANTAGED CHILDREN TO SUFFER FROM LOST LEARNING TIME, NUTRITIONAL DEFICIT DURING CRITICAL LEARNING PERIODS, AND ADVERSE MOTIVATION AND PERSONALITY CHANGES. IN INTERVENING TO PROVIDE THE BEST LEARNING CONDITIONS FOR THE DISADVANTAGED CHILD, EDUCATORS SHOULD RECOGNIZE THE IMPORTANCE OF THE CHILD'S HEALTH TO HIS LEARNING EFFECTIVELY. (NH)

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Herbert G. Birch

Albert Einstein College of Medicine

Yeshiva University

This paper was commissioned under United States Office of Education Contract #6-10-240 (ERIC). It was also used at the Conference on "Bio-Social Factors in the Development and Learning of Disadvantaged Children," held in Syracuse in April 1967 under the terms of United States Office of Education Contract #6-10-243.

Ferkauf Graduate School of Humanities and Social Sciences

Yeshiva University

55 Fifth Avenue

New York, N. Y. 10003

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Herbert G. Birch, M.D., Ph.D.[1]

* A working paper to be presented at the Conference on "Bio-Social Factors in the Development and Learning of Disadvantaged Children" to be held in Syracuse, New York, April 19-21, 1967.

ACKNOWLEDGMENTS

1. The research reported was supported in part by the National Institutes of Health, National Institute of Child Health and Human Development (HD-00719); the Association for the Aid of Crippled Children; and the National Association for Retarded Children.

The background examination of the literature and the detailed spelling out of many problems was not the individual work of the author but was carried out in conjunction with Mrs. Joan Gussow and Mrs. Ronni Sandroff Franklin.

INTRODUCTION

There is some danger that a necessary and entirely warranted focusing of attention upon social and cultural factors which may effect educational achievement can cause us to neglect certain bio-social factors which through a direct or indirect influence on the developing child affect his primary characteristics as a learner. Such a danger is exaggerated when a fragmentation of administrative concern with health and with education exists. It becomes possible for the educator and the sociologist to concentrate quite properly on features of curriculum, familial environment, motivation, cultural aspects of language organization, and the patterning of preschool experiences. Such a concentration is entirely fitting. However, it becomes one-sided and potentially self-defeating when it takes place independently of, and without detailed consideration of the child as a biological organism. To be concerned with the child's biology is not to ignore the cultural and experiential opportunities which may affect him. Clearly, to treat such organismic factors as a substitute for experiential opportunity[1] is to ignore the intimate interrelation between the biology of the child and his environment in defining his functional capacities. However, it is equally dangerous to treat cultural influences as though they were acting upon an empty organism and to fail to recognize that effective environment is not identical with objective situations[2] but is rather the product of the interaction of organismic characteristics with the objective opportunities for experience. The child who is apathetic because of malnutrition, whose sequence of prior experiences may have been modified by acute or chronic illness, whose selectivity as a perceiver and organizing ability as a learner may have been affected by previous exposure to risks of damage to the central nervous system, cannot be expected to respond to opportunities for learning in the same way as

does a child who has not been exposed to such conditions. The assumption that an increase in objective opportunities for learning, though entirely admirable in itself, will overcome such biologic disadvantage is unsupported by existing knowledge.[3,4]

If children have been exposed to exceptional conditions of risk for biologic insult, at least two paths of concern may be defined. The first is that in the current generation such children must be identified and not merely additional but special educational opportunities effective for them must be provided. Moreover, since no socially deprived group can be considered to be homogeneous for organismic disability, groups of children deriving from such backgrounds must be differentiated from one another in order, most effectively, to identify meaningful subgroups for purposes of remedial, supplemental and habilitative education. The second path is one that must concern itself with future generations. If conditions of risk to the organism can be identified, and if the conditions productive of such risk can be changed for the better, an opportunity exists through the application of public health principals and of current bio-social knowledge significantly to reduce learning handicap in future generations.

We wish to argue, therefore, that a concern with the education of the socially disadvantaged cannot in good conscience restrict itself to the provision either of equal or special educational and preschool opportunities for learning. Rather, it must concern itself with the totality of factors contributing to educational failure, among which the health of the child is a variable of primary importance.

To advance such an argument is not new. The basic relationship between poverty, illness and educational failure has long been known as has the fact expressed by James[5] that "poverty begets poverty, is a cause of poverty

and a result of poverty." What is new is the nature of the society in which such an interaction occurs. As Galbraith has put it "to secure each family a minimum standard, as a normal function of society, would help insure that the misfortunes of parents, discerned or otherwise, were not visited on their children. It would help insure that poverty was not self-perpetuating. Most of the reaction, which no doubt would be almost universally adverse, is based on obsolete attitudes. When poverty was a majority phenomenon, such action could not be afforded... An affluent society has no similar excuse for such rigor. It can use the forthright remedy of providing for those in want. Nothing requires it to be compassionate. But it has no high philosophical justification for callousness."[6]

The pertinence of Galbraith's concern as it applies to the health of children, particularly those in the non-white segments of our population, is underscored first by the fact that according to the Surgeon General Stewart[7] the United States standing with respect to infant mortality has been steadily declining with respect to other countries in the world. Though we are the richest country our 1964 infant mortality rate of 24.8 per 1000 live births causes us to rank fifteenth in world standing. Had we had Sweden's rate, the world's lowest, approximately 43,000 fewer infants would have died in that year. Of particular pertinence to the problem of social disadvantage is the fact that the mortality rate for non-white infants is twice as high as that for whites with the highest rates for the country as a whole in the east south central states, Kentucky, Tennessee, Alabama and Mississippi. Wegman in reviewing these figures has noted that "Mississippi again has the dubious distinction of having the highest rate (infant mortality)...more than twice that of the lowest state."[8] Most of this difference could be related to the higher Negro population of Mississippi.

The data on infant mortality has been extended to other features of child health by Baumgartner[9] and by Densen and Haynes.[10] These workers have pointed out that although detailed and careful documentation of the "degree and magnitude of the health problems" of the Negro, Puerto Rican, and Indian groups are not readily available, a strikingly dangerous picture may be pieced together as a montage from various public health statistics, research studies, and occasional articles. The picture is striking, not merely because it shows these minority groups to be at a significant health disadvantage with respect to the white segment of the population, but because it indicates a secular trend in the disparity between these groups in the degree of relative health disadvantage to which the non-white groups are subject. Thus, while in 1930 twice as many non-white as white mothers died in childbirth in 1960 "for every white mother who lost her life in childbirth, four non-white mothers died."[9] In 1940 the number of non-white mothers delivered by poorly trained midwives was fourteen times that for white mothers, a discrepancy that rose to twenty-three times as great by 1960. As Gold[11] has pointed out when the general overall death rate for mothers in childbirth had reached an alltime low of 3.7 per 10,000 live births, this change was largely due to the reduction of the mortality rate among white mothers to 2.6. Non-white mothers had a death rate four times as great, 10.3, a rate characteristic of white mothers two decades earlier. In generalizing these findings Baumgartner has suggested "that the most advantaged non-white family has a poorer chance of having a live and healthy baby than the least advantaged white family."[9] And Densen and Haynes considering ethnic differences in health over the whole life span have suggested "that health differences are inextricably interwoven with cultural, economic, educational and other variables...(that) the important challenges facing the health professions in the United States...is narrowing the gap (and

that) the highest priority are research in health manpower, organization, delivery and utilization of health services."[10]

Given this general overview of the currently existing differential in the condition of health of the non-white and white segments of the American population it appears essential that in our concern with educational disadvantage we concurrently recognize the excessive risk of ill-health relevant to educational handicap that exists in the children with whose welfare and education we are concerned. To this end we shall explore certain selected features of health that are directly relevant for education and consider the degree to which they serve to differentiate the population of socially disadvantaged children from other children in our country.

PREMATURITY AND OBSTETRICAL COMPLICATIONS

Few factors in the health history of the child have been as strongly associated with later intellectual and educational deficiencies as prematurity at birth and complications in the pregnancy from which he derives.[12] Although a variety of specific infections, explicit biochemical disorders, or trauma may result in more clearly identified and dramatic alterations in brain function, prematurity together with pre and perinatal complications most probably are factors which most broadly contribute to disorders of neurologic development.[13,14] It is, therefore, suitable for us to begin a more detailed consideration of health factors which may contribute to educational failure by an examination of prematurity and the factors associated with it.

Prematurity has been variously defined either by the weight of the child at birth, by the maturity of certain of his physiologic functions, or by gestational age.[15] Independently of the nature of the definition in any society in which it has been studied, prematurity has an excessive representation in the lower social strata and among the most significantly socially

disadvantaged. In seeking to analyze the significance which may attach to an excessive representation of prematurity in any social group it is essential to bear in mind that its presence is simultaneously indicative of two separate conditions of risk. In the first place fetuses that are primarily abnormal and characterized by a variety of congenital anomalies are more likely to be born before term than are normal fetuses. Second, infants who are born prematurely, even when no congenital abnormality may be noted, are more likely to develop abnormally than are infants born at term. Thus, Baumgartner has noted that follow-up studies have "indicated that malformation and handicapping disorders (neurological, mental, and sensory) are more likely to be found among the prematurely born than those born at term. Thus, the premature infant not only has a poorer chance of surviving than the infant born at term, but if he does survive he has a higher risk of having a handicapping condition."[16] One consequence of this association between prematurity and neurological, mental, sensory and other handicapping conditions is the excessive representation of the prematures among the mentally subnormal and educationally backward children at school age.[12,17]

Baumgartner[16] has presented the distribution of live births by birth weight for white and non-white groups in the United States for 1957. The data reflecting this distribution are presented in Table 1. For the country as a whole 7.6 percent of all live births weighed 2500 gms. or less. In the white segment of the population 6.8 percent of the babies fell in this low birth weight range. In contrast 12.5 percent of the non-white infants weighed 2500 gms. or less, with their frequency at all levels of low birth weight being twice as great as that of white infants. Baumgartner has attributed the high incidence of prematurity among non-whites to the greater poverty of this group. The studies of Donnelly, et al.,[18] in North Carolina, of Thomson[19] in Aberdeen

Scotland, and of Shapiro, et al.,[20] in New York suggest that a congery of factors including nutritional practices, maternal health, the mother's own growth achievements as a child, as well as deficiencies in prenatal care and birth spacing and grand multiparity interact to produce group differences between the socially disadvantaged and more advantageously situated segments of the population.

It has sometimes been argued that the excess of low birth weight babies among the socially disadvantaged is largely a consequence of ethnic differences. It has been argued that Negroes "naturally" give birth to smaller babies and that the excess of prematurity merely reflects this phenomenon. However, the high association of prematurity with social class in an ethnically homogeneous population such as that in Aberdeen,[19] the finding of Donnelly, et al., that within the Negro group higher social status was associated with reduced frequency of prematurity,[18] the findings of Pakter, et al., that illegitimacy adds to the risk of prematurity within the non-white ethnic group,[21] and the suggestion made by Shapiro, et al., that a change in the pattern of medical care for the better reduces the prevalence of prematurity,[20] all make the ethnically based hypothesis of "natural difference" difficult to retain.

If gestational age is used instead of birth weight as an indication of prematurity, the non-whites are at an even greater risk than is the case when birth weight has been used. The data in Table 2 indicate that 18.1 percent of non-white babies born in New York City during 1958-59 had a gestational age of 36 weeks or less in contrast to a rate of 8.5 percent for live-born white babies.

Both the data on birth weight and the data on gestational age leave little doubt that prematurity and its attendant risks are excessively represented in the non-white segment of the population. Moreover, an examination

in detail of regional data such as that provided by Donnelly, et al., for hospital births in university hospitals in North Carolina[18] indicate clearly (Table 3) that in that community the most advantaged non-white has a significantly greater risk of producing a premature infant than the least advantaged segment of the white population.

When the survival of premature infants is considered,[22] it is clear that for equal degrees of prematurity non-white infants have a somewhat better chance for survival during the first month of life. However, during the remainder of infancy this likelihood is reversed particularly for infants weighing between 1500 and 2500 gms. at birth. Viewing these data, Baumgartner has concluded that, "this observation strongly suggests that inadequate medical care, inadequate maternal supervision, inadequate housing and associated socio-economic deprivations are exerting unfavorable influences on the later survival of those non-white babies who initially appear the more favored. It is apparent that socio-economic factors not only influence the incidence of low birth weight in all ethnic groups, but greatly influence survival after the neonatal period."[16]

If the low birth weight and survival data are considered distributively rather than categorically, it appears that the non-white infant is subject to an excessive continuum of risk reflected at its extremes by perinatal, neonatal, and infant death, and in the survivors by a reduced functional potential.

THE BACKGROUND OF PERINATAL RISK

Having considered the increased risk attaching to the socially disadvantaged child at birth, we can now proceed to analyze the social distribution of some of the factors which appear to affect this condition.

Clearly, the risk of having a premature baby or a complicated pregnancy and delivery begins long before the time of the pregnancy itself. A

series of studies carried out in Aberdeen,Scotland on the total population of births of that city[19,23,24] have indicated that prematurity as well as pregnancy complications are significantly correlated with the mother's nutritional status, height, weight, concurrent illnesses, and the social class of her father and husband. Although the relation among these variables is complex, it is clear that the women born in the lowest socio-economic class and who have remained in this class at marriage were themselves more stunted in growth than other women in the population, had less adequate dietary and health habits, were in less good general health, and tended to be at excessive risk of producing premature infants. The mother's stature as well as her habits were determined during her childhood, tended to be associated with contraction of the bony pelvis,[23] and appeared systematically related to her risk condition as a reproducer. In analyzing the relation between maternal health and physique to a number of obstetrical abnormalities such as prematurity, caesarean section and perinatal death, Thomson (Table 4) has shown each of these to be excessively represented in the mothers of least good physical grade.[25]

The finding of a relation between the mother's physical status and pregnancy outcome is not restricted to Scotland. Donnelly, et al., in his study of North Carolina University hospital births has shown a clear distribution of height with social class. In Class I (the most advantaged whites) 52 percent of the women were less than 5 feet 5 inches tall. In contrast in social class IV (the least advantaged non-whites) 75 percent of the women were under 5 feet 5 inches in height. The proportion of shorter women increased consistently from Classes I to IV and within each class the incidence of prematurity was higher for women who were less than 5 feet 3 inches tall. Moreover, within any height range the least advantaged whites had lower prematurity rates than the most advantaged non-whites. Thus in the least advantaged whites less than

5 feet 3 inches tall the prematurity rate was 12.1 percent as contrasted with a rate of 19.6 percent for the non-whites in the same height range. In the tallest of the most disadvantaged whites the rate was 5.6 percent whereas in non-whites of the same height range who were least disadvantaged the prematurity rate was 10.1 percent.[18]

The physical characteristics of the mother which affect her efficiency as a reproducer are not restricted to height and physical grade. As early as 1933 Mellanby while recognizing that "direct and accurate knowledge of this subject in human beings is meagre," asserted that nutrition was undoubtedly "the most important of all environmental factors in childbearing, whether the problem be considered from the point of view of the mother or that of the offspring."[26] It was his conviction that the reduction of a high perinatal mortality rate as well as of the incidence of maternal ill health accompanying pregnancy could effectively be achieved by improving the quality of the diet. Acting upon these views he attempted to supplement the diets of women attending London antenatal clinics and reported a significant reduction in morbidity rates during the puerperium.

Although Mellanby's own study is difficult to interpret for a number of methodologic reasons, indirect evidence rapidly came into being in support of his views. Perhaps the most important of these was the classical inquiry directed by Sir John Boyd-Orr and reported in Food, Health and Income.[27] This study demonstrated conclusively that the long recognized social differential in perinatal death rate was correlated with a dietary differential, and that in all respects the average diet of the lower income groups in Britain was inadequate for good health. Two years later McCance, Widdowson and Verdon-Roe[28] confirmed the Boyd-Orr findings in a meticulous study of the individual diets of 120 pregnant women representing a range of economic groups ranging from the

wives of unemployed miners in South Wales and Tyneside to the wives of professionals. The diet survey technique which they used and which has, unfortunately, been rarely imitated since, was designed to minimize misreport. The women were given a balance scale and printed instructions on how to weigh and keep a record of all food eaten for the period of one week. Lower class women were, in addition, visited individually in their homes every day and their day's entries inspected and discussed with them to increase their accuracy. The results of the survey showed that there was wide individual variation in the intake of all foods which related consistently neither to income nor to intake per kilogram of body weight. But when the women were divided into six groups according to the income available for each person per week, the poorer women proved to be shorter and heavier and to have lower hemoglobin counts. Moreover, though economic status had little effect on the total intake of calories, fats and carbohydrates, "intakes of protein, animal protein, phosphorus, iron and Vitamin B_1 rose convincingly with income." The authors of the study offered no conclusions about the possible outcome of the pregnancies involved, but the poorer reproductive performance of the lower class women was clearly at issue. For as they stated, "optimum nutrition in an adult implies and postulates optimum nutrition of that person as a child, that child as a foetus, and that foetus of its mother."

A second body of indirect data supporting Mellanby's hypothesis derived from data of animal studies on the relation of diet to reproduction. These studies typified by the series begun by Warkany[29] demonstrated that pregnant animals maintained on diets deficient in certain dietary ingredients produced offspring suffering from malformation. Thus, it appeared that a diet which was adequate to maintain maternal life and reproductive capacity could be inadequate for normal fetal development. In short, the fetus was not a perfect

parasite and at least for some features of growth and differentiation could have requirements different from those of the maternal host.

Beginning with these studies and the interest they provoked, the literature abounds in investigations on the relation between dietary practices in the mother and the outcome of her pregnancy. It would divert us from the main line of our inquiry to consider each of these studies in detail. However, Duncan, Baird, and Thomson[30] in surveying these studies as well as the wartime experiences in Britain have argued convincingly that the fall in stillbirth and neonatal death rate could only be attributed to a reduction in poverty accompanied by a scientific food rationing policy. Certainly there was no real improvement in prenatal care during the war when so many medical personnel were siphoned off to the armed forces. Furthermore, the improvement took place chiefly among those deaths attributed to "ill defined or unknown" causes -- that is among those cases when low fetal vitality seems to be a major factor in influencing survival -- and these types of death "are among the most difficult to influence by routine antenatal practice." Of all the possible factors then, nutrition was the only one which, as Garry and Wood wrote in 1945,[31] improved during the war years. It was this fact which led Thomson[32] to remark that the result was "as a nutritional effect" all the more convincing "because it was achieved in the context of a society where most of the conditions of living other than the nutritional were deteriorating."

At about the same time that the National "feeding experiment" was going on in the British Isles, a similar, though more controlled experiment investigating the effects of close nutritional supervision during pregnancy, was being carried out by Dr. K. Utheim Toverud on the continent of Europe.[33] In 1939 Dr. Toverud set up a health station in the Sagene district of Oslo to serve pregnant and nursing mothers and their babies. Though war broke out

shortly after the station was opened, and it became progressively more difficult to get certain protective foods, an attempt was made to insure that every woman being supervised had the recommended amounts of every essential nutrient, through the utilization of supplementary or synthetic sources when necessary. Cod liver oil was used as a source of Vitamins A and D, brewer's yeast to provide B vitamins, and synthetic ascorbic acid to substitute for scarce natural sources. Because of the shortage of meat -- the principal source of protein was dried fish -- iron salts were used to provide additional iron. In spite of food restrictions which became increasingly severe toward the end of the war in 1943-44, the prematurity rate among the 728 women who were supervised at the station never went above the 1943 high of 3.4% averaging 2.2% for the period 1939 to 1944. Among the unsupervised mothers the 1943 rate was 6.3% and the average for the period 4.6%. In addition, the stillbirth rate of 14.2/1000 for all women attending the health station was half that of the women in the surrounding districts.

Meanwhile, even as the British and Norwegian feeding experiments were in progress, there were some hopefully never-to-be repeated starvation experiments going on elsewhere; and when they were reported after the war, the childbearing experiences of various populations of women under conditions of severe nutritional restriction were to provide evidence of the ways in which deprivation could negatively affect the product of conception, just as dietary improvement appeared able to affect it positively.

Smith,[34] for example, studying infants born in Rotterdam and the Hague during a delimited period of extreme hunger brought on by a transportation strike, found that the infants were shorter and lighter (by about 240 grams) than those born both before and after the period of deprivation. Significantly enough Smith also found that those babies who were five to six month fetuses when the

hunger period began appeared to have been reduced in weight as much as those who had spent a full nine months in the uterus of a malnourished mother. He was led to conclude from this that reduced maternal caloric intake had its major effect on fetal weight beginning around the sixth month of gestation. Antonov's study of babies born during the siege of Leningrad[35] confirmed the fact of weight reduction as well as Smith's observation that very severe deprivation was likely to prevent conception altogether rather than reduce the birth weight. Antonov found that during a six month period which began four months after the start of the siege, there was an enormous increase in prematurity as judged by birth length -- 41.2% of all the babies born during this period were less than 47 cm. long and fully 49.1% weighed under 2500 grams. The babies were also of very low vitality -- 30.8% of the prematures and 9% of the full term babies died during the period. Abruptly, during the latter half of the year, the birthrate plummeted -- along with the prematurity rate. Thus, while 161 prematures and 230 term babies were born between January and June, 1942, five prematures and 72 term babies were born between July and December. Where information was available it suggested that the women who managed to conceive during the latter part of the year, when amenorrhea was widespread, were better fed than the majority, being employed in food industries or working in professional or manual occupations which had food priorities. It was Antonov's conclusion from his own data that while the fetus might behave for the most part like a parasite, "the condition of the host, the mother's body, is of great consequence to the fetus, and that severe quantitative and qualitative hunger of the mother decidedly affects the development of the fetus and the vitaly of the newborn child."

Long after the war, Dean[36] was able to confirm the Smith and Antonov results with a careful analysis of a series of 22,000 consecutive births at the

Landesfrauenklinik, Wuppertal, Germany, during the years 1937-1948. The report demonstrated again that deprivation produced small infants, and that maximal deprivation produced maximal size reduction -- average weights and lengths at birth being lowest in 1945, the year of the greatest food shortage. But it also became apparent that the babies in this series were not premature -- or that they were not premature to the extent implied by their size -- and that the small reduction in the average duration of gestation was insufficient to account for the degree of weight reduction observed. Thus it appeared to have been demonstrated, even more clearly than before that severe hunger did not merely reduce the mother's ability to maintain the pregnancy to term, but could act directly through the placenta to reduce the growth of the infant.

At the conclusion of the war, the evidence in favor of a relationship between nutritional status in pregnancy and the course and outcome of that pregnancy was broadly suggestive. For all their failures in experimental design, the pre-war and wartime studies and the uncontrolled feeding and underfeeding experiments of the war had raised a number of issues which asked to be explored.

These wartime and post-war analyses leave little doubt of an association between maternal diet and the growth and development of the child in utero. Moreover, they suggest that the nature of the diet is significantly associated with pregnancy course and complications.

It is unfortunate that most of the more recent studies of the relation of maternal nutrition to pregnancy course and outcome have tended to obscure rather than to clarify the issue. Most of these studies, such as the excellently conducted Vanderbilt Cooperative Study of Maternal and Infant Nutrition,[37,38,39] have produced confusing and equivocal findings because of patient selection. Since the women included for study have tended to be those who

registered for obstetrical care early in pregnancy the lowest class women were markedly unrepresentative of their social group. As a result, these studies have failed to include the very women who are most central to our concern. What is sorely needed is a detailed study of nutrition and pregnancy course in socially disadvantaged women who came to obstetrical notice far too late to be included in the usual dietary surveys in obstetrical services. The design of such a study and its conduct would not be easy. However, if conducted, it would have one virtue absent in most extant studies -- pertinence.

As has just been suggested in the consideration of the limitations of recent dietary surveys, obstetrical care is markedly different in socially advantaged and disadvantaged segments of the population. A preliminary view of the obstetrical care received by lower-class pregnant women may be obtained from a consideration of Hartman and Sayle's survey of 1380 births at the Minneapolis General Hospital in 1962.[40] This hospital which served medically indigent patients living in census tracts having notably high rates of infant mortality delivered 43 percent of its patients with either no prenatal care or only one third trimester antenatal visit. Of the women who did attend the hospital's prenatal clinic, 3 percent made their initial visit during the first trimester, 26 percent in the second trimester and 71 percent in the last trimester. Infant mortality appeared to vary according to prenatal care. The mothers having no prenatal care experienced fetal deaths at a rate of 4 percent, a rate considerably higher than the 0.7 percent fetal death rate for mothers having one or more visits to the prenatal clinic.

A survey by Boek and Boek[41] of obstetric care in upper New York State extends our understanding of the issue. The sample studied was collected through an examination of birth certificates and the 1805 mothers interviewed were grouped according to social class as determined by the child's father's occupa-

tion. The amount and type of obstetric care correlated with social class. Mothers in the lowest social classes tended to seek health care later during pregnancy than higher class women. Lower class mothers tended to use a family doctor for both pre- and post-natal care, rather than the obstetric specialists and pediatricians heavily patronized by upper class women. More than twice as many upper class women attended group meetings for expectant parents than did lower class mothers. Lower class women tended to stay in the hospital fewer days than upper class women, and although the former paid lower doctor's bills, they tended to pay higher hospital bills since more higher than lower class families had hospital insurance. Three months after the birth of the child fewer lower class women had received postnatal checkups than upper class women and fewer mothers in the lowest social class had their babies immunized with a triple vaccine or planned to have this done. Ninety-three percent of the mothers in the higher social classes were giving their baby vitamins, although only 83 percent of the lowest class mothers were doing so.

The effects of a good, comprehensive health program on pregnancy losses was studied by Shapiro, et al.,[20] in a comparison of the infant mortality rates for members of the Health Insurance Plan and the general New York City population. Obstetric-gynecology diplomates delivered 72 percent of the HIP babies. Only 24 percent of the general New York population received specialist care, and only 5 percent of non-white babies were delivered by specialists (Figure 1). Because of these radical differences in type of delivery care, the investigators compared the HIP prematurity and perinatal mortality rates only to those New Yorkers who were patients of private physicians. Socio-economic status was judged by the occupation of the father as recorded on birth and death certificates. The data on prematurity for the three year period are presented in Table 5. The white patients who participated in the Health Insurance Plan had their pre-

maturity rate reduced from the 6 percent rate characteristic for their group in the city as a whole to 5.5 percent. This reduction just missed statistical significance at the 5 percent level. In the non-white group the rate was reduced from 10.8 to 8.8 percent, a difference significant at the .01 level of confidence. Within each specific category of physician used, Shapiro found that white deliveries had a far lower perinatal mortality than non-white for the general New York City group (Table 6). General service deliveries had a far greater mortality rate than private physician cases in hospitals for both the white and non-white groups. "Among white deliveries mortality was considerably higher for general service cases than for those under the care of private doctors in each occupation category... This raises the interesting question whether the greater mortality in general service is principally due to factors associated with type of care or the setting in which it is received, or whether the poorer risk women within each occupation class tend to turn to general service."

One example of the type of risk that careful prenatal attention can diminish is shown in Kass's study of bacteriuric pregnant women in the Boston City Hospital prenatal clinic.[42] The investigators originally formulated the study to see if treatment for bacteriuria during pregnancy would have any ill effects on the health of the fetus, but shifted emphasis when they found that bacteriuric women had a dramatically higher rate of infant mortality and prematurity than non-bacteriuric women. Patients diagnosed bacteriuric and adequately treated so that they were non-bacteriuric at term had a 14 percent lower prematurity rate than untreated women (Table 7). Since the incidence of bacteriuria was 6 percent of the pregnant women seen at the prenatal clinic (Table 8), Kass predicted that "it should be possible to lower the total perinatal death rate by about 25 percent and the total prematurity rate by between 10 and 20

percent, simply by screening for bacteriuria and treating it properly."

In view of the potential importance of prenatal care for pregnancy course and outcome and the suggestion that such care is deficient in the lowest socio-economic groups it is important to examine the ethnic distribution of antenatal care. The study of Pakter,[21] though restricted to New York City is representative of conditions that exist on a national scale. His findings reported in Table 8a can be replicated in any urban community having a significantly large non-white population. In rural areas the situation is equally bad. Approximately 38 percent of married Negro mothers and 39 percent of Puerto Rican mothers received no prenatal care during the first six months of the pregnancy. In contrast, only 13 percent of white married mothers were subjected to a similar lack of care.

POST-NATAL CONDITIONS FOR DEVELOPMENT

Densen and Haynes[10] have indicated that many types of illness are excessively represented in the non-white segments of the population at all age levels. Rather than survey each of these conditions in detail we shall select one, nutritional status, as the model variable for consideration. The reason for this selection derives from the fact that a considerable body of evidence from animal experimentation as well as field studies of populations at nutritional risk[4] have suggested a systematic relation between nutritional inadequacy and both neurologic maturation and competence in learning.

At birth the brain of a full-term infant has achieved about one quarter of its adult weight. The bulk of subsequent weight gain will derive from the laying down of lipids, particularly mylen, and cellular growth. Animal experiments on the rat,[43] the pig[44,45] and the dog,[46] have all demonstrated a significant interference in brain growth and differentiation associated with severe

dietary restriction, particularly of protein, during the first months of life. In these animals the behavioral effects have been dramatic with abnormalities in some cases persisting after dietary rehabilitation.

The generalization of these data to the human situation is made difficult by the extreme severity of the dietary restrictions. More modest restrictions have been impcsed by Widdowson[47] and Barnes.[48] In the latter experiment simple learning was tested both during restriction and after dietary rehabilitation. These indicated some tendency for poorer learning in the nutritionally deprived animals.

Cowley and Griesel[49,50,51] have reported on persistent nutritional deprivation in a parent and two filial generations of rats. Their findings have suggested a cumulative effect of malnutrition on adaptive behavior across generations.

The animal findings as a whole can be interpreted either as suggesting a direct influence of malnutrition on brain growth and development, or as resulting in interference with learning at critical points in development. In either case the competence of the organism as a learner appears to be influenced by his history as an eater. These considerations add cogency to an already strongly held belief that good nutrition is important for children and links our general concerns on the relation of nutrition to health to our concerns with education and the child's functioning as a learner.

Incidents of severe malnutrition appear rarely in the United States today, but there is evidence to suggest that the low income segments of the population suffer from subtle, sub-clinical forms of malnutrition which may be partially responsible for the higher rates of morbidity and mortality of children in this group. Brock[52] suggest that "dietary sub-nutrition can be defined as any impairment of functional efficiency of body systems which can be corrected

by better feeding." Since "constitution is determined in part by habitual diet... diet must be considered in discussing the aetiology of a large group of diseases of uncertain and multiple aetiology..." The relationship between nutrition and constitution is demonstrated by the fact that the populations of developed nations are taller and heavier than those of technically underdeveloped nations and that "within a given developed nation children from economically favoured areas are taller and heavier than children from economically underprivileged areas."

In comparison to the vast body of data available on the diets of peoples in tropical countries, very little research has been done in recent years on the nutritional status of various economic groups in the United States. The abundant American food supply may be the cause of the "unfortunate tendency in recent years for nutritionists and clinicians to dismiss the adverse effects of malnutrition on resistance to infection as unproved or unimportant... In the highly developed countries...the nutritional status of the population has improved to the point where malnutrition severe enough to influence the course of an infection is rare. Under these circumstances the <u>short-term</u> effects on nutritional status of acute infection are not of serious consequences."[53] The effects of long term sub-clinical malnutrition on the health of the individual, however, are not yet known and little research has been directed at this problem in the period since 1939. However, it is instructive to review the studies comparing the diets of low-income people with the rest of the population since these lay the basis for hypothesizing that nutritional differences may have some effect on the overall differences in health and learning ability between groups.

The nutritional differences between lower and higher income individuals begin before birth and continue thereafter. In a study of maternal and child health care in upper New York State, Walter Boek, et al.,[54] found that babies from low income families were breast fed less often and kept on only milk diets

longer than upper income infants. Moreover, while 93 percent of the infants from higher class families received vitamin supplements, only 83 percent of those from lower income families were taking supplements at three months of age.

In a study of breast feeding in Boston, Salber and Feinleib[55] confirmed Boek's results and, "social class was found to be the most important variable affecting incidence of breast-feeding. Women who are married to students exhibit the highest incidence of breast-feeding (69.3%). Upper social class women breast-feed more frequently (39.8%) than women in lower social classes (13.6%) (Table 9)."

Social class differences in feeding patterns continue after weaning. Filer and Martinez[56] studied 4,642 six month old infants from a nationally representative sample and found that "infants of mothers with least formal education and in families with lowest incomes are fed more milk formula..." and less solid foods at six months old than those from higher educational and economic groups (Table 10). Class differences in the intake of most nutrients varied primarily according to the amount of milk formula consumed.

The researchers found that for "almost all nutrients studied, the mean intakes were well above recommended levels. The single exception was iron; more than half of infants do not get the lowest recommended provision -- a finding that corroborates the results reported by a number of other investigators." Iron deficiency was most prevalent among infants of mothers with low educational and income levels and infants whose mothers attained no more than a grade school education received a mean intake of only 6.7 mg. of iron a day, as compared to the 9.1 mg. mean intake of infants whose mothers had attended high school. Since "nutritional iron deficiency is widespread and most prevalent in infants in the low socio-economic group," and iron deficiency is the most common cause of anemia in infants during the first two years of life, malnutrition at least with respect to this nutrient is widely prevalent in lower class infants.

While this national survey found the diets of low income infants to be fairly adequate except for iron deficiency, a study of Negro, low-income infants in South Carolina[57] uncovered more extensive areas of malnutrition in this group. The researchers concern sprang from the fact that the death rate for Negro infants in South Carolina was twice as great as the national rate. Thirty-six Negro infants from low income families were tested when they visited a Well-Baby Clinic for routine examinations. The subjects ranged in age from four to ten months. "The body weights of 66 percent of the infants were below the 50th percentile in the Harvard growth charts, 34 percent below the 10th percentile and 9 percent below the 3rd percentile."

The investigators found that 29 percent of the subjects had "serum albumin concentrations which have been associated with marginal protein nutrition" and serum globulin concentrations below normal range. Sixty-one percent had total protein concentrations below normal and 33 percent had "serum ascorbic acid concentrations which have been associated with a sub-optimal intake of Vitamin C." In addition to these group indications of sub-clinical malnutrition, one infant's albumin concentration showed severe protein deficiency and "eight... infants had concentrations of serum ascorbic acid reflecting a severely limited dietary intake of Vitamin C." The researchers concluded that "it would appear possible that malnutrition may be one of the many underlying causes for the high rate of Negro infant mortality in South Carolina." Since Greenville County, where the study was conducted, has a relatively low number of infant deaths, "it is possible that malnutrition may be even more severe and/or prevalent in many other counties of the state."

Since the samples used in this study is quite small (36 infants), the results must be viewed as suggestive rather than conclusive. But taken together with Filer's findings on iron intake,[56] a New York study which shows that

anemia is common among Negro and Puerto Rican infants,[58] and the recent finding that "some anemia was present in 59 percent of Glasgow slum children,"[59] the suggestion is strengthened that poor diet may be partly responsible for the poor health of lower socio-economic class children.

The studies so far reviewed have dealt with populations that are in some way representative of the nutritional status of large groups of children. Since these studies are few in number and limited in approach, they cannot give a complete picture of the nutritional status of lower class Americans. Hints about areas of malnutrition which have not been thoroughly investigated can be drawn from studies of special groups within the American population. In a survey of the "Dietary and Nutritional Problems of Crippled Children in Five Rural Counties of North Carolina," Bryan and Anderson[60] found that the diets of 73 percent of the 164 subject sample were less than adequate. The cause for the malnourishment of nine out of ten of the poorly fed children was poor family diet and in only one out of ten cases was the malnutrition related to the physical handicap of the child.

Although all the children were from families in the low income group, the researchers found certain significant differentiations between the Negro and white families studied. The interviewers recorded information about the daily food intake of the child, day-to-day variations in diet, weekly food shopping and the adequacy of home conditions for food storage and preparation. The child's diet was then translated into nutrient values and rated for degree of adequacy. On this basis seventy-one percent of the Negro children and 35 percent of the white children's diets were rated as probably or obviously inadequate. Only a limited number of food items were used and "in many of the families...only one food was cooked for a meal and this would be eaten with biscuits and water, tea or Kool-Aid... For the most part, the diets of our low income families contained few foods that are not soft or that require much chewing."

Suggestions of poor nutrition in infancy and childhood can also be drawn from studies of constitutional differences as well as from measurements of food intake. Einhorn[61] studied two New Jersey communities. School children were diagnosed as over or underweight by a physician rather than by height-weight tables. In the affluent community ("A") 3.8 percent of the children were found overweight and 1.2 percent underweight. Community "B", the non-affluent group, had a higher percentage of both under and overweight children, 9.7 percent and 9.6 percent respectively. While heredity and physical activity can of course influence the weights of children, it seems probable that social class differences in nutrition also played a role in producing the obtained differences.

A study of the nutritional status of junior high school children in Onondaga County, New York[62] compared subjects from broadly different economic groups. School "M" was 94 percent Negro, while Schools "L" and "J" were overwhelmingly white. The schools were also differentiated on the basis of the occupations of the students' fathers: "... of the 58 percent of the employed fathers from school M, 52 percent were laborers, whereas only 10 percent from school L and 38 percent from school J were in this category." When the heights and weights of the subjects were compared, a greater percentage of students from the lower-socio-economic class school fell in the short stature and low-weight zones. There was also a tendency for students from the predominantly Negro school to have less subcutaneous fat by ranking of skinfold than students from other schools.

When the subjects were asked whether or not they had eaten breakfast on the morning of the examination, 41 percent of the students from the lower economic group had not, while only 7 and 4 percent of the students from the other two schools had missed breakfast. There was also a slightly greater

tendency for the white, higher income students to take supplements. Even those students in the lower class group who had eaten breakfast had a lower intake of calories, protein, iron, thiamine, riboflavin and ascorbic acid than subjects from the other schools.

Blood and urine samples were taken for all the subjects and the researchers set up criteria to determine the level of adequacy for the various nutrients. "Subjects from school M, (the Negro school) had a slightly lower average hematocrit, largely due to the greater number of female subjects from that school in the low classification (and) the average plasma ascorbic acid value for school M was about half as great as the average in school L." There was also a tendency for the Negro population to have low values for hexose and pentose when erythrocyte hemolysate transketolase activity was determined. The authors feel that further investigation is needed before any "implications of nutritional inadequacy can be drawn from this observation." Average urinary excretions of riboflavin and thiamine was above acceptable level in all groups, "but data for folinic acid indicated lower levels of excretion for children from school M than for children in schools L and J." The question whether this observation was related to the lower ascorbic acid levels of these children indicates a need for further study in this area. The authors conclude that the differences between the schools show a relationship between nutrition and socio-economic status. These differences are greater than the differences between male and female students, and are related to each other on the various parameters of the study. "There was a slight indication that the growth of the male subject in...school (M) had not been as great as that of the subjects in the other schools with whom they were compared. This fact was supported by somewhat lower average levels in the other parameters..."

Although the students at the predominantly Negro school in Onondaga

County did not appear to suffer from gross nutritional deficiencies, their diets were significantly less adequate than the subjects from the white, middle-class schools. The investigators did not attempt to link dietary habits with health records, but the results of the study lead to speculations about the relationship between suboptimal diet, rates of infection, school absence and academic performance.

The question of why, in a society with an abundant and often enriched food supply, several groups of the population are not adequately nourished has only begun to be answered. The answer appears to lie in two broad areas: money and information. Cultural differences in food habits and beliefs, though important, appear to lose their significance relatively quickly when adequate funds, higher general education, and sound knowledge of proper nutrition become available. Thus in an article on "The Nutritional Status of American Negroes," Jean Mayer[63] finds that "the food habits of Negroes belonging to the higher socio-economic classes appear to be essentially those of their white counterparts, (however) it can be fairly stated that in general the state of nutrition of Negroes is inferior to that of whites in the same geographic areas. In some cases, it is vastly inferior." Just as poverty and lack of education breed poor eating habits among lower economic class Negroes, low income combined with a good education can produce adequate nutrition, as has been shown in a comparison of the dietary habits of student wives with other low income groups.[64]

In a detailed study of the "Eating Patterns Among Migrant Families" in Palm Beach County, Florida, Delgado, et al.,[65] found that a combination of low income, lack of education, lack of kitchen equipment and proper storage facilities contributed to dramatically poor diets in the migrant families. Of the 35 families examined, the greatest number had 7 to 8 members living in one or two rooms with average weekly earnings from $36. to $43. "From $18. to $22. per

week, about half their weekly earnings, was spent for food by the 18 families which had from 7 to 9 members each. According to Department of Agriculture standards, from $35. to $47. would be required to feed families of this size a low-cost adequate diet."

The diets of the families were surveyed on a 24 hour recall basis; serving spoons and plates were measured in order to estimate the amount of food per serving. When the family diets were analyzed in terms of the various nutrients, only 20 percent of the families met the National Research Council calorie requirements. Thiamine, protein, Vitamin A and iron requirements were not met by over 50 percent of the families. About 80 percent did not meet the requirements for calcium and riboflavin and 97 percent did not have enough Vitamin C. When the diets were analyzed in terms of food groups, it was found that none of the families met stated requirements for milk, green and yellow vegetables; only a few had citrus fruits and tomatoes, potatoes or other fruits and vegetables and eggs; and only 43 percent of the families met the daily requirements for meat.

Although physical examinations were not included in the study, "reports of examinations made in the health department clinics showed an apparent relationship between the dietary and medical findings. Families with lower intakes of necessary nutrients had diagnoses of rickets, marasmas, kwashiorkor, obesity, emaciation, nutritional anemia, and malnutrition, as compared with persons in the remainder of the group. Many of the children in families with lower intakes of nutrients were pale and underweight, and eight adults were markedly obese. Two women gave a history of miscarriages." A dental study of the study group showed "40 persons with dry and cracked lips, 14 with spongy gums, 27 with gums that bled easily, 21 with slight gingivitis, and 16 with signs of severe gingivitis." Most of the people had dental caries, and many

had lost permanent teeth. These findings indicate a definite relationship between dental caries and problems of the gums and lips and a low intake of protective foods. These dental figures may be supplemented by the data presented in a recent government publication[66] which reports that in a national sample 63 percent of non-white children between 5 and 14 years of age have never been to a dentist.

Negro migrant agricultural workers have "the highest proportion of malnourished individuals of any group in the country," and Mayer[63] finds the "shortage of published data in this field striking." Although lack of money to buy nutritious foods is apparently the major reason for malnourishment, the lack of information about nutrition is also to blame for both the rural and urban Negro diet. A monotonous, limited diet is the rule for Southern rural Negroes and the inadequacy of the diet is exaggerated for Southern urban Negroes for whom the availability of green vegetables is decreased. "Consumption of fresh vegetables is low and consumption of citrus fruits negligible. Milk consumption is substantially lower than in white families... This is for a large part a reflection of lower income; but even at equal income, milk consumption may be lower for Negro families." Although calorie requirements are usually met in urban families, protein, calcium, thiamine, riboflavin, nicotinic acid, Vitamin A and Vitamin C requirements are often inadequately met.

In the North "even as approximate a description of the nutritional status of the Negro population is impossible to arrive at." Mayer observes, however, that familiar Southern foods of minimal nutritional value, such as turnip, mustard greens, kale, okra and plantains, are stocked by stores in northern Negro areas. "Careful perusal of the records available in large cities, as well as the collection of impressions of experienced physicians, dietitians, and health administrators, leaves little doubt that our Negro slums represent

the greatest concentration of anemias, growth failures, dermatitis of doubtful origin, accidents of pregnancy and other signs associated with malnutrition."

Although the studies reviewed here are helpful for their indications and descriptions of areas of sub-optimal nutrition in this country, a detailed and comprehensive study of the nutrition of the low income population is still lacking. Since sub-optimal nutrition can have social and psychological ramifications, as well as constitutional and medical results, a more thorough knowledge of the ways in which nutrition can affect the daily life of the individual would be useful for all those who seek to improve the health and social well being of the poor.

SUMMARY AND CONCLUSIONS

This review has been brief. In it we have sought to examine certain selected conditions of health which may have consequences for education. Among these have been the conditions of obstetrical and perinatal risk affecting the child *in utero* and at birth, and the circumstances, particularly those relating to nutritional opportunities which may shigificantly affect his development and ability as a learner subsequent to being born. Clearly, such factors as acute and chronic illness, immunizations, dental care, the utilization of health services and a host of other phenomena, perhaps equally pertinent to those selected for consideration, have been dealt with either in passing or not at all. These factors have, however, been examined and in fact reflect the same picture that emerges from a consideration of the variables upon which we have focused attention. In brief, though much of the information is incomplete, though certain aspects of the data are sparse, a serious consideration of available health information leaves little or no doubt that children who are economically and socially disadvantaged and in an ethnic group exposed to discrimination, are ex-

posed to massively excessive risks for maldevelopment.

Such risk may have at least two consequences for the functioning of the child as a learner. The first of these is direct and the second indirect. Conditions of ill health may directly affect the development of the nervous system and eventuate either in patterns of clinically definable malfunctioning in this system or in sub-clinical conditions. In either case the potentialities of the child as a learner cannot but be impaired. Such impairment, though it may in fact have reduced functional consequences under exceptionally optimal conditions for development and education, in any case represents a primary handicap which efforts at remediation may only partially correct.

The presence of excessive conditions of risk for nervous system dysfunction make it essential that in programs for remedial and supplemental education, careful consideration be given to the child as an organism and appropriate health, educational and remedial services provided. Given an excess in conditions of risk, socially disadvantaged children cannot be treated as a single homogeneous group but rather must be differentiated in accordance with the manner in which functions have been impaired by sub-optimal conditions both biologic and social to which the child has been exposed. At the level of research we need much more detailed information on the conditions of insult to which socially disadvantaged children are exposed. At the level of practice, we must institute the immediate application of available knowledge with the goal of optimizing conditions for physical and mental development.

The indirect effects of ill health or of conditions of sub-optimal health care on the learning processes may take many forms. Only two can be considered at this point. Children who are ill nourished are reduced in their responsiveness to the environment, distracted by their visceral state, and reduced in their ability to progress and endure in learning conditions. Conse-

quently, given the same objective conditions for learning, the state of the organism modifies the effective environment and results in a reduction in the profit which a child may derive from exposure to opportunities for experience. Consequently, the provision of equal opportunities for learning in an objective sense is never met when only the school situation is made identical for advantaged and disadvantaged children. Though such a step is indeed necessary, proper and long overdue, a serious concern with the profitability of such improved objective opportunities for socially disadvantaged children demands a concern which goes beyond education and includes an intensive and directed consideration of the broader environment, the health and functional and physical well-being of the child.

Inadequacies in nutritional status as well as excessive amounts in intercurrent illness may interfere in indirect ways with the learning process. As Cravioto, DeLicardie and Birch[4] have put it, at least "three possible indirect effects are readily apparent:

(1) Loss of learning time. Since the child was less responsive to his environment when malnourished, at the very least he had less time in which to learn and had lost a certain number of months of experience. On the simplest basis, therefore, he would be expected to show some developmental lags.

(2) Interference with learning during critical periods of development. Learning is by no means simply a cumulative process. A considerable body of evidence exists which indicates that interference with the learning process at specific times during its course may result in disturbances in function that are both profound and of long term significance. Such disturbance is not merely a function of the length of time the organism is deprived of the opportunities for learning. Rather, what appears to be important is the correlation of the experiential opportunity with a given stage of development--

the so-called critical periods of learning. Critical periods in human learning have not been definitively established, but in looking at the consequences associated with malnutrition at different ages one can derive some potentially useful hypotheses. Relevant to the relation between time of life at which malnutrition develops and learning may be the earlier report of Cravioto and Robles[67] who have shown that as contrasted with older patients, infants under six months recovering from kwashiorkor did not recoup their mental age deficit during the recovery period. In older children, ranging from 15 to 41 months of age, too, the rate of recovery from the initial mental deficit varied in direct relation to chronological age at time of admission. Similarly, the findings of Barrera-Moncada[68] in children, and those of Keys, et al.,[69] in adults, indicate a strong association between persistence of later effects on mental performance and periods of onset and duration of malnutrition.

(3) Motivation and personality changes. It should be recognized that the mother's response to the infant is to a considerable degree a function of the child's own characteristics of reactivity. One of the first effects of malnutrition is a reduction in the child's responsiveness to stimulation and the emergence of various degrees of apathy. Apathetic behavior in its turn can function to reduce the value of the child as a stimulus and to diminish the adult's responsiveness to him. Thus, apathy can provoke apathy and so contribute to a cumulative pattern of reduced adult-child interaction. If this occurs it can have consequences for stimulation, for learning, for maturation, and for interpersonal relations, the end result being significant backwardness in performance on later more complex learning tasks."

However, independently of the path through which bio-social pathology interferes with educational progress, there is little doubt that ill health is a significant variable for defining differentiation in the learning potential

of the child. In the course of our efforts to intervene effectively in the maximization of learning among disadvantaged children it would be disastrous if we were either to ignore or to relegate the physical condition and health status of the child with whose welfare we are concerned to a place of unimportance. To do so would be to divorce education from health; a divorce which can only have disorganizing consequences for the child. If we were to break the cycle which runs from poverty, ignorance to poverty, the conjoined links in this circle -- health and education -- must be simultaneously sundered.

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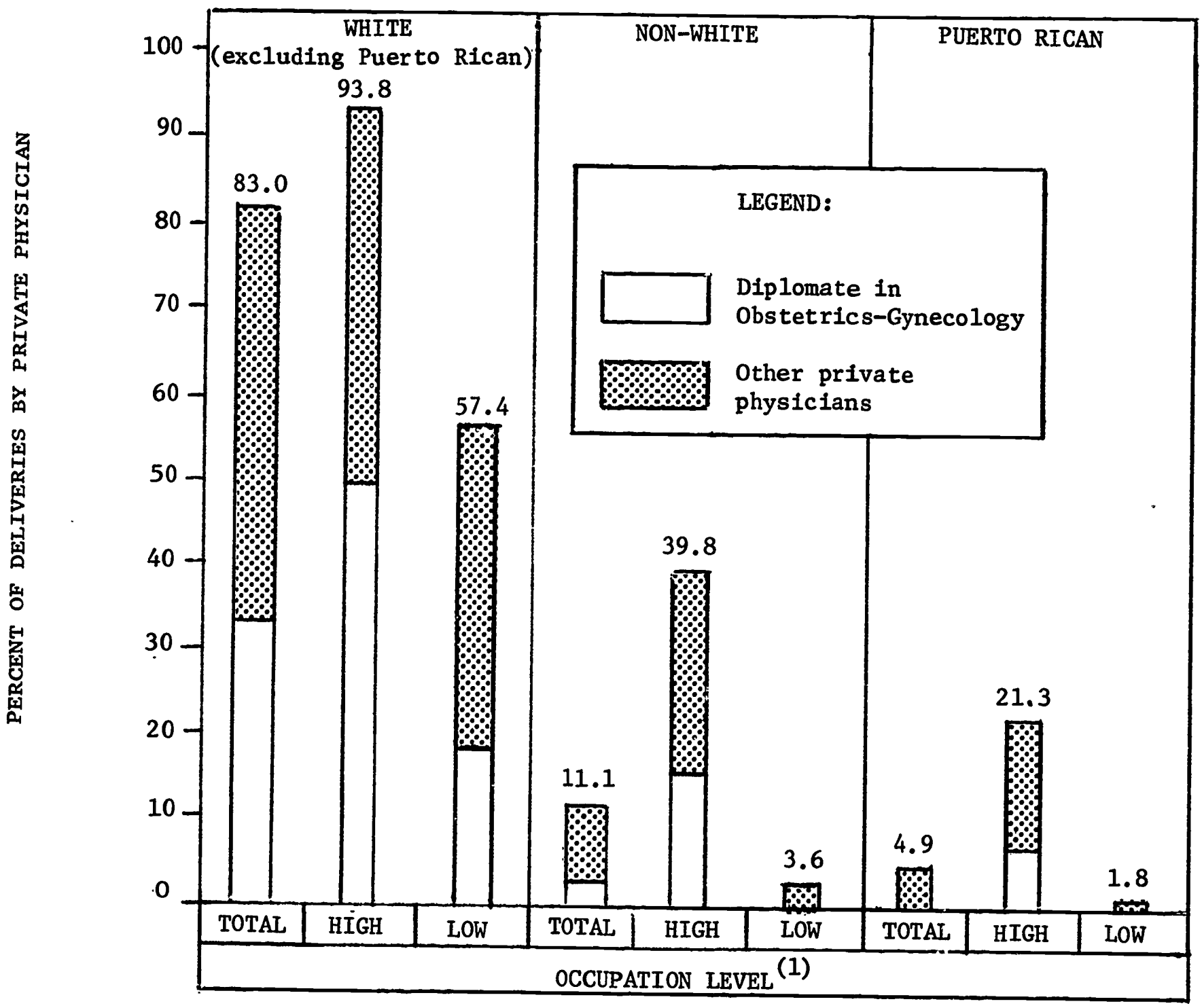
Figure 1

Percent of Single Live Births that Had Private Physician in Attendance by Level of Father's Occupation and Ethnic Group, New York City, 1955



Note: The complements of the percentages shown refer to deliveries in general service (ward), at home or in an ambulance; 96 percent of these cases are general service.

(1) "High" refers to "Professional, Managerial, Technical"; "low" refers to "Laborers and other."

From Shapiro, 1960

Table 1

PERCENTAGE DISTRIBUTION OF 4,254,784 LIVE-BIRTHS
BY BIRTH WEIGHT AND ETHNIC GROUP, USA 1957

Birth weight (g)	Total	White	Non-white
1,000 or less	0.5	0.4	0.9
1,001-1,500	0.6	0.5	1.1
1,501-2,000	1.4	1.3	2.4
2,001-2,500	5.1	4.5	8.1
2,501-3,000	18.5	17.5	24.5
3,001-3,500	38.2	38.4	37.2
3,501-4,000	26.8	28.0	19.6
4,001-4,500	7.3	7.8	4.8
4,501-5,000	1.3	1.3	1.3
5,001 or more	0.2	0.2	0.2
Total	100	100	100
Percentage under 2,501 g	7.6	6.8	12.5
Median weight (g)	3,310	3,330	3,170
Number of Live Births	4,254,784	3,621,456	693,328

From Baumgartner, 1962

Table 2

SINGLE LIVE-BIRTHS BY DURATION OF GESTATION AND ETHNIC GROUP, NEW YORK CITY, 1958 AND 1959

Duration of gestation (weeks)	White		Non-white	
	Number	%	Number	%
36 or less	22,184	8.5	12,021	18.1
37 or more	235,013	89.7	52,285	78.7
Duration not reported	4,861	1.8	2,143	3.2
Total	262,058	100	66,449	100

From Baumgartner, 1962

Table 3

Incidence of prematures
among single live births by race
and socioeconomic class

	Socioeconomic class				
	White		Nonwhite		
	I	II	III	IV	Total
Total live births	12,035	10,091	3,940	3,495	29,561
Premature live births	603	879	526	513	2,521
Per cent premature	5.0	8.7	13.3	14.7	8.5

From Donnelly, 1964

Table 4

Incidence of obstetric abnormalities in Aberdeen primigravidae by maternal health and physique as assessed at the first antenatal examination. Twin pregnancies have been excluded.

	Health and Physique			
	Very good	Good	Fair	Poor; very poor
Prematurity* (%)	5.1	6.4	10.4	12.1
Caesarean section (%)	2.7	3.5	4.2	5.4
Perinatal deaths per 1000 births	26.9	29.2	44.8	62.8
No. of subjects	707	2088	1294	223
Percentage tall (5 ft 4 in. or more)	42	29	18	13
Percentage short (under 5 ft 1 in.)	10	20	30	48

* Birth weight of baby 2500 g or less.

From Thomson, 1961

Table 5

Prematurity Rates by Ethnic Group,
New York City, and HIP (Adjusted) 1955-1957

Single Live Births Attended by Private Physician in Hospital

Ethnic Group	Prematurity Rate per 100 Live Births[1]			
	New York City[2]	HIP Adjusted[2]	Standard Error of Difference	P[3]
Total (Excluding Puerto Rican)	6.2	5.7	0.23	0.04
White	6.0	5.5	0.24	0.06
Nonwhite	10.8	8.8	0.74	<0.01

1. Prematurity rate is defined as the number of live births 2,500 gm or less per 100 live births.
2. New York City rates are observed rates for deliveries of women of all ages excluding those under 20 and age not stated.
   HIP rates are adjusted to age of mother and ethnic distribution of New York City deliveries (excluding deliveries to women under 20 and age not stated).
3. "P" represents the probability that NYC-HIP difference is due to chance factors.

From Shapiro, 1960

Table 6

Perinatal Mortality Rates by Occupation of Father and Ethnic Group, New York City (Private Physician and General Service), and HIP, 1955

Single Births and Fetal Deaths

Rate per 1,000 Live Births and Fetal Deaths[1]

Occupation	New York City					HIP
		Private Physician in Hospital			General Service[5] and Other	
	Total	Total	Diplomate in Ob.-Gyn.	Other		
White (Excluding Puerto Rican)						
Total	29.6	27.1	25.5	28.1	43.2	20.1
Prof., Mgr., Tech.	28.3	27.6	26.9	28.2	40.0	14.1
Clerical, Sales	25.3	24.2	20.9	26.8	34.6	9.3[2]
Crafts., Oper., Serv.	29.5	26.9	25.3	27.7	40.6	24.8
Laborers, Other	41.9	34.0	34.4	33.7	54.2	25.2[3]
Nonwhite						
Total	59.8	49.3	48.6	49.6	61.2	28.1
Prof., Mgr., Tech.	53.9	43.9[3]			60.5	
Clerical, Sales	40.2	50.0[3]	4	4	37.8	4
Crafts., Oper., Serv.	45.0	31.9			46.9	
Laborers	86.6	136.5[3]			84.7	

1. Perinatal mortality rate is defined as infant deaths under seven days plus fetal deaths, 20 weeks gestation or more per 1,000 live births plus fetal deaths (20 weeks gestation or more). Rates exclude deliveries among women under 20 years of age.
2. Based on only five perinatal deaths and subject to large sampling variability (coefficient of variation close to 50 per cent).
3. Based on small number of perinatal deaths; coefficient of variation is about a third.
4. Not shown; majority of rates in these columns based on very small numbers of perinatal deaths.
5. General service (ward) cases represent about 96 per cent of the births in this category. The remainder are primarily deliveries at home or in an ambulance.

From Shapiro, 1960

Table 7

Effect of Bacteriuria During Pregnancy on Occurrence of Pyelonephritis, Prematurity, and Perinatal Death

Patient Group	No. of Patients	No. with Pyelo-nephritis	Premature Infants (per cent)	Perinatal Mortality (per cent)
Untreated bacteriuric	48	20	24	14
Treated bacteriuric	43	0	10	0
Non bacteriuric	1000	0	9	2

From Kass, 1960

Table 8

Occurrence of Bacteriuria in Various Population Groups Surveyed at Boston City Hospital

6%	of 335 females in medical outpatient department
4%	of 102 males in medical outpatient department
18%	of 54 diabetic females in outpatient department
5%	of 37 diabetic males in outpatient department
6%	of 4000 pregnant females making their first prenatal visit
98%	of 100 patients with indwelling catheters for 96 hours
2%	of 350 patients, previously without bacteriuria, who underwent single catheterization
30%	of 76 female patients on medical wards
12%	of 82 male patients on medical wards
70%	of 13 male patients on genitourinary ward

From Kass, 1960

Table 8a

	WHITE		PUERTO RICAN		NON-WHITE	
	married	unmarried	married	unmarried	married	unmarried
Private services	85.8	17.3				
Ward services	12.2	81.0	90.4	97.5	82.1	97.4
Prenatal care in first six months	87.2	36.7	60.4	43.5	61.7	42.9

Drawn from Pakter, 1961

Table 9

Incidence and Duration of Breast-Feeding Among 2,233 Mothers

		SOCIAL CLASS OF FATHER	
	Students	Class 1 & 2 (Warner's)	Class 3 - 7 (Warner's)
Total Number	88	550	1595
Number Breast-Feeding	61	219	217
Percentage Breast-Feeding	69.3	39.8	13.6
P For Difference in Proportion	$<.01$	$<.01$	$<.01$
Mean Duration (Days)	123.0	111.7	98.5
P For Difference in Means	$>.05$	$>.05$	$>.05$

Data drawn from Salber and Feinleib, 1966

Table 3. Single-Day Mean Caloric Intake of Six-Month-Old Infants

Sample	Total Calories N*	Mean ± S.D.		Percentage Distribution of Calories: Milk	Fruit	Cereal	Veg.	Meat	Egg	Fruit Juice	Other
Total U.S.	4,146	822	248	67	11	4	4	4	4	4	2
Male	2,080	846	253	66	11	4	4	5	4	4	2
Female	2,017	798	241	68	11	4	4	4	4	4	2
Primiparous	1,047	805	232	64	11	4	4	5	4	5	2
Multiparous	2,948	829	252	68	11	4	4	4	4	4	2
Urban	2,731	831	248	65	12	4	4	5	4	4	2
Rural	1,416	803	249	70	10	3	3	4	3	4	2
Pediatrician care	1,755	812	239	65	12	4	4	5	4	4	2
General practitioner care	2,233	828	250	69	10	4	4	4	3	4	2
Education of mother											
Grade school	294	808	315	72	8	3	3	3	5	5	1
High school	2,726	836	253	67	11	4	4	4	4	4	2
Post high school	1,088	793	207	65	12	4	4	5	4	4	3
Annual family income											
Less than $4,000	894	844	304	69	9	3	3	4	4	5	2
$4,000-$7,000	1,948	823	233	67	11	4	4	4	4	4	2
More than $7,000	1,135	803	217	65	12	4	4	5	4	4	3

* N = Number of infants. Although the total number used in the survey = 4,146, N values vary since some mothers failed to indicate sex of infant, parity, family income, etc.

Filer and Martinez, 1964